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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/731,745	12/08/2003	Peidong Yang	UC03-118-3	5099

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EXAMINER

RAO, G NAGESH

ART UNIT PAPER NUMBER

1722

DATE MAILED: 07/24/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No.	Applicant(s)	
	10/731,745	YANG ET AL.	
	Examiner	Art Unit	
	G. Nagesh Rao	1722	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 03 July 2006.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 2-23 and 25-37 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 2-23 and 25-37 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

## **DETAILED ACTION**

### ***Allowable Subject Matter***

1) The indicated allowability of claims 4-5, 8, 24, 13-22, and 30-35 are withdrawn in view of the newly discovered reference(s) to Empedocles (US Patent No. 6,962,823). Rejections based on the newly cited reference(s) follow.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

2) Claims 2-23, 25-29, and 30-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hoffman (US Patent No. 5,352,512) in view of Empedocles (US Patent No. 6,962,823) which has support from an earlier claim of CIP benefit to provisional application 60/370,113 (enclosed for verification and support of subject matter).

Hoffman discloses a method of making tubes of 5 nanometer (nm) or greater diameter. The wall thickness is about 1nm or more. The material of the tube can be polymer, ceramics, metals. These tubes are formed on fibers of carbon, glass, or other fibers (See Abstract) which would automatically suggest that they are formed as the result of and in the context of "epitaxial casting". In Col. 1 Line 55-60, these materials include silica, carbon, carbides, oxides, nitrides. Oxides or high temperature oxides are the preferred materials for the tubes (Col 2 Lines 15-20). Others are given in Col. 2 Lines 50-67 as ferrous metals, non-ferrous metals, boride, semiconductors, and diamond. The fibers are fixed in a preform configuration and held rigidly in that configuration (Col 2 and Col 3). Then the fibers are cleaned and then coated. Then, the fibers are removed by gas phase or liquid phase etching. The tube material is not destroyed by the techniques used to remove the fiber. The fibers are described as carbon or graphite in Col. 4 Lines 65+ and as quartz or polymer in Col. 5 Lines 1-10. In Col. 5, the coating of the

nanotubes is suggested. Thermal oxidation ranging from 800-1000<sup>0</sup>C temperature range is disclosed in Cols 3-4 Lines 38-68 and 1-68 as well in Col. 6 Lines 50-65.

Thus the method of forming a nanotube (i.e. a tube of nano-size) by deposition of a material over a nano-wire (i.e. a nano-sized fiber) and then removing (i.e. sacrificing) the nano-wire to form a nanotube (i.e. a longitudinal segment) comprised of the material is anticipated by Hoffman 512. Additionally, the nano-wire is used in Hoffman as a form for the nanotube and thus the nano-wire anticipates the used of a sacrificial template for the nanotube. Also anticipated are the carbon or graphite fibers (i.e. the group IV element group Carbon) and polymers used as the nano-wire material. Forming multiple layers (i.e. multiple longitudinal segments) by coating the nano-tubes is also disclosed. Forming the tube material by oxidation of the wire is also disclosed (Col. 6 Lines 50-65 and Col 7 Lines 1-9) and thus anticipated by Hoffman 512 as well the teachings of figures 1-3 suggest that the tube can be resulted as formed from a plurality of layers given the “ridge-like” features.

However Hoffman 512 fails to explicitly teach or suggest that the nanotube having a single crystal structure by using single crystal structured nano-wires as a template or an array of the sort.

Empedocles 823 pertains to a method for making, positioning, and orienting nanostructures, nanostructure arrays, and nanostructure devices. Therein enclosed in the specification of Empedocles 823 are the specified teachings of utilizing a single crystalline nano-structured nano-wire (See Col 16 Lines 10-30) that which would be embodied along with for a nano-structured array and template (See Col 17 Lines 41-61). These templates and arrays are utilized in an efficient manner of production for the fact that the end result of these techniques are advanced nano-devices in the electrical and bio-nano art.

Furthermore Empedocles 823 teaches in its definition section a variety of well known materials that can be used for the nano-structured devices which by the way encompasses both nano-wires and nano-tubes. The choices of materials include the use of materials such as ZnO, GaN, Si, Ge, Ag, Au, Groups II-VI materials, elemental group IV materials, and metals (See Col. 15-16 Lines 1-68). Finally Empedocles 823 teaches that it is well known to use Gas and Plasma Phase Continuous Reactor for Nanostructure Synthesis, which would encompass the use of precursors, via CVD techniques, such as ammonia or trimethylgallium fed along with argon and nitrogen gas carriers, as well the specified temperature reactions range around 400-500<sup>0</sup>C but that does not mean that the CVD processing parameters would not or could not be capable of being altered to 600-700<sup>0</sup>C

considering the closeness of temperature range (See Col. 40 Lines 34-68, Cols. 41-42 Lines 1-68).

Therefore it would be obvious at the time of the invention to one with ordinary skill in the art to employ the processing, growth, and apply the knowledge of known materials capable of being used of Empedocles 823 to that of Hoffman 512 in order to optimize and create better processing techniques for fabrication of these nano-tubes via a sacrificial nano-wire template in order to obtain a product suitable for nano, bio, and quantum electronic devices.

### *Response to Arguments*

3) Applicant's arguments filed 7/3/06 have been fully considered but they are not persuasive. Examiner has noted applicant's arguments but respectfully disagrees with the conclusion.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

First the teachings of the invention pertaining to a nanotube from an epitaxial casting as recited in claim 4, not being a single-crystalline structure, in fact that phrase was deleted. The other pertaining independent claims had variations in their language but none reflected to that of “forming a nanotube from a single-crystalline material or an epitaxial casting”. Therefore that argument put forth is moot for consideration.

Second, applicant's contend that the rejection lacks the teaching of 800-1000<sup>0</sup> C range for thermal oxidation in secondary reference Empedocles 823. Examiner understands said position, but notes that the portion of the rejection was covered by primary reference Hoffman 512 in the above rejection.

Finally the main argument as to whether there is motivation to combine the two references is what is in question. Considering the two references are analogous art in the same field of technological endeavor there is substantive technological motivation to combine the two references given they both endeavor in the field of nanotechnology and nanotubes process manufacturing.

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found



either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

### ***Conclusion***

4) **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

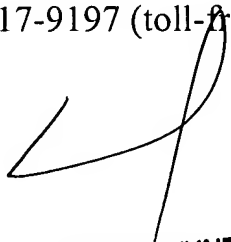
A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to G. Nagesh Rao whose telephone number is (571) 272-2946. The examiner can normally be reached on 9AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Yogendra Gupta can be reached on (571)272-1316. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

GNR



**ROBERT KUNEMUND**  
**PRIMARY EXAMINER**